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Natural sources of Aeolian dust in Amman, and selected Areas of Jordan.

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Abstract

The overall aim of this research programme is to characterise potential sources of atmospheric dusts deposited in the Amman (urban), Mafraq (rural) and Azraq (desert) areas of Jordan. These dusts derive from a number of sources, some of which may be remote from the point of deposition and will reflect long range transport during dust storms. The potential dust sources will be characterised by their mineral magnetic, radionuclide and geochemical signatures which will be quantitatively compared, using an un-mixing model, with the same signatures of deposited dusts in each area.

The aim of this paper is to identify the potential natural and anthropogenic sources of dust and the impact that human activity may have in increasing the availability of dust from natural sources for transport.

Geologically it is important to identify those rocks and minerals that could weather by natural processes to provide material fine enough to be entrained by the wind. Part of this study therefore focuses on an analysis of the geological materials capable of producing such fine sediments. The major natural process increasing air pollution in the research areas is the dust storm (sandstorm) which affects the desert areas more than the highlands. However, in north-eastern Jordan over the last decade, changes in agricultural practices, especially the clearance of surface stone layers in the basalt regions for cultivation, may have increased the availability of dust in these regions for aeolian transport. Soil erosion in the hilly areas causes landslides while tree cutting and overgrazing by large numbers of livestock may also increase sediment availability.

Small localised anthropogenic sources of contaminated dust may also be released in rural and desert areas but these pollutants will be rapidly dispersed and diluted by wind, washout by rain or through deposition with large quantities of natural dusts.

Direct contributions to air pollution primarily affects urban areas where the density of building, industry and vehicles prevents pollutants from being dispersed. Urban air pollutants include particulate matter, heavy metals and acidifying gases such as SO_4, NO_x. The city of greater Amman is suffering from serious air pollution problems from nearby industries.

Other activities, especially quarrying, mining and building construction sites in and around Amman may also make additional natural geological materials available for transport. These include limestone extraction for building construction and cement production in the south of the city. Another major source of dust to the west of Amman derives from the Al Fuhays cement factory because most of the prevailing winds are from the west. The most important source of dust in the north is from the sandstone quarries of the Safout area. The eastern areas of Amman and Ruseifa have been greatly affected by emissions from major industrial plants, phosphate mining and phosphate processing. These phosphate deposits, and processed phosphates, are characterised by elevated levels of U-235.